

REMARKS

Reconsideration of the above-identified application in view of the foregoing amendments and following remarks is respectfully requested.

A. Status of the Claims and Explanation of Amendments

Claims 1-27 were pending. By this paper, Figure 7 and claims 1-3 and 11 are amended, and new claims 28-30 are added.

Several formal matters were raised by the Office Action in connection with claims 1, 3 and 11. Claim 1 and 3 were alleged to be indefinite because of certain antecedent basis issues identified by the Examiner. The requested corrections have been made. In addition, claim 2 was amended to recite “the light decrease gradient,” instead of “the gradient.”

Claim 11 was objected to because the phrase “according to” was missing before “Claim 3.” Appropriate correction has been made.

These amendments are not made for any substantial reasons related to patentability (§§102, 103).

Withdrawal of the objection to claim 11 and the Section 112 rejection of claims 1-27 is respectfully requested.

In addition, claim 1 is amended to specify that in the final “analyzing” step, the analysis is a “compar[ison of] the distribution of luminosity.” Support for this claim

amendment is found throughout the application as originally filed, including at pages 12-13 and Figures 4C and 5C.

Further, new claims 28-30 are added. Dependent claim 28 further recites “controlling lateral orientation of at least one vehicle headlight based on the determination of the angle of the road.” Support for this new claim is found throughout the application as originally filed, including for example at page 16.

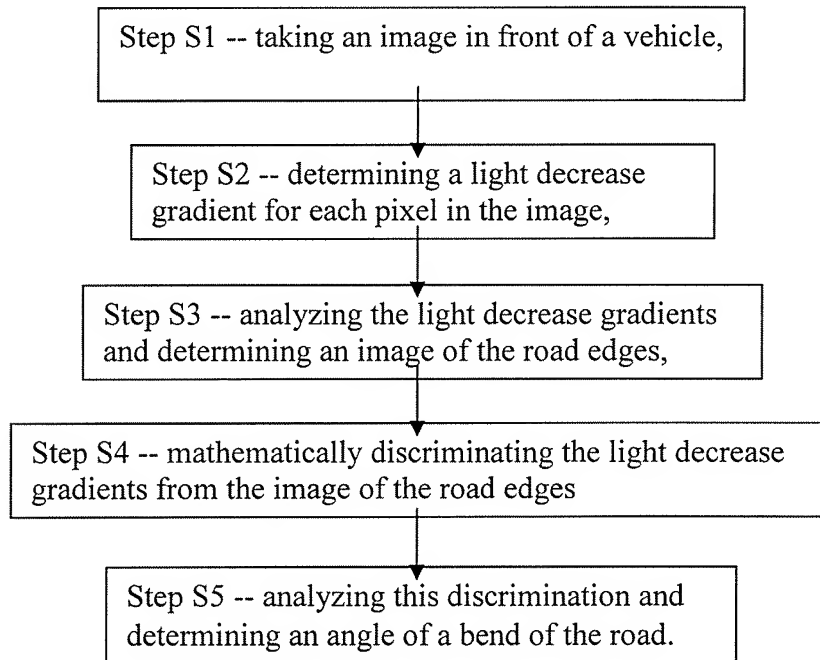
Dependent claim 29 describes the step of mathematically discriminating and recites “generating a first curve corresponding to the number of pixels having a decrease vector oriented from the left of the image towards the center of the image, and generating a second curve corresponding to the number of pixels having a decrease vector oriented from the left of the image towards the center of the image. Dependent claim 30 describes the step of analyzing the discrimination and recites “deducing the shape of the road ahead based on the form of the first and second curves.” Support for these new claims is found throughout the application as originally filed, including for example at page 11.

The office action also raised two objections with the drawings. First, the office action complains that no figure shows the method of independent claim 1. [3/7/07 Office Action at p. 2].

Applicants respectfully traverse this objection. The method of claim 1 recites several steps, which are shown in various figures. The “taking” step is shown in Figures 1, 4A, 5A, and 6A. The steps of “determining... a light decrease gradient” and

“analyzing these light decrease gradients and determining an image of the road edges” are shown in Figures 2, 4B, 5B and 6C. The “mathematical[] discriminat[ion]” step is shown in Figures 3, 4C, 5C and 6C. The final “analysis” step, although not expressly shown in the figures, is detailed the specification, which explains how the results of “mathematical[] discriminat[ion]” step are used to determine that a left bend is shown in Figure 3, a right bend is shown in Figure 4C, a straight away is shown in Figure 5C and a tight light bend is shown in Figure 6C. Withdrawal of this objection to the drawings is respectfully requested.

If the Examiner would like a schematic flow chart to show the order of these steps, Applicants would be willing to provide such a figure (although it is believed to be unnecessary) as follows:



Second, the office action complains that Figure 7 should be provided with “labeled part names instead of only having numbers as the labels.” [3/7/07 Office Action at p. 3]. A replacement Figure 7 is provided herewith. In addition to the reference numerals, labels have been added as requested by the Examiner.

As to the merits, all of the pending claims were found to be novel over the prior art. However, the Office Action made a number of obviousness-type rejections. Specifically, claims 1-3 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,819,779 to Nichani (“Nichani”) in view of U.S. Patent No. 5,922,036 to Yasui et al. (“Yasui”). [3/7/07 Office Action at pp. 5-6]. Claims 4-5 and 11 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nichani in view of Yasui and further in view of U.S. Patent No. 6,501,856 to Kuwano et al. (“Kuwano”). [3/7/07 Office Action at p. 7]. Claims 6-9, 12-13, 16-18, 21-22 and 25-26 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nichani in view of Yasui and further in view of U.S. Patent Publ. 2003/0123706 to Stam et al (“Stam”). [3/7/07 Office Action at pp. 8-9]. Claims 14-15, 19-20, and 23-24 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nichani in view of Yasui, Kuwano and Stam. [3/7/07 Office Action at pp. 9-10]. Claims 10 and 27 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Nichani in view of Yasui and Stam and further in view of U.S. Patent No. 5,550,717 to Liao (“Liao”). [3/7/07 Office Action at p. 11].

B. Claims 1-30 are Patentably Distinct from the Cited References

The rejections of claims 1-27 are respectfully traversed. The requirements for such rejections are not met because each of the cited references fails to teach, disclose or suggest the particular analysis by comparing the distribution of luminosity as recited in Applicants' claim 1. Specifically, Applicants' claim 1 recites:

“1. A method of detecting from a vehicle variations in path on a road having a surface and road edges comprising:
- taking an image of a road scene unfolding in front of the vehicle and at least partly illuminated by the vehicle,
- determining, for each pixel in the image a light decrease gradient,
- analyzing these light decrease gradients and determining an image of the road edges,
- mathematically discriminating the light decrease gradients from the image of the road edges, and
- analyzing this discrimination by comparing the distribution of luminosity and determining an angle of a bend of the road.”

Nichani is directed to a lane detection system that uses lane markers to determine the position of the vehicle on the roadway. [See, e.g., Nichani, Col. 3, lines 9-19]. For example, the passage referenced in the office action (Col. 5, lines 35-42) is part of a discussion by Nichani of how to discern, for example, the width of the lane markers to more precisely determine the location of the vehicle. There is no analysis by Nichani of light decrease gradients to determine an image of the road edges (as distinguished from lane markers).

In any case, the office action concedes that Nichani fails to teach, disclose or suggest “analyzing [Applicants’ mathematical] discrimination and determining an angle of a bend of the road.” [3/7/07 Office Action at pp. 6-7]. For this feature, office action relies upon Yasui.

Yasui is directed to a lane detection sensor and navigation system. Like Nichani, Yasui’s system involves the use of lane markers. A camera takes an image of the road. [Yasui, Col. 4, lines 57-60]. Then, the data of the image is analyzed to find the “contour points” corresponding to lane markers. [Yasui, Col. 4, line 61- Col. 5, line 3]. These “countour points” are identified by finding “edge intensities” exceeding a given threshold value. [Yasui, Col. 5, lines 31-35 (“At step S4, points exceeding initially this threshold value th are retrieved by scanning the image upwardly from the bottom portion of the image and laterally in opposite directions from the center of the image and are set as contour points of the right and left lane markers of the road.”)]. These “countour points” then are used to generate polynomials corresponding to that data. [Yasui, Col. 5, lines 3-17].

According to the office action, Yasui discloses that a radius of a curvature of a road ahead of a running vehicle is calculated using an angle formed between two tangents. [3/7/07 Office Action at p. 7 (citing Col. 2, lines 32-41)]. That portion of Yasui’s disclosure states:

“Another object of the present invention is to provide an arithmetic unit for calculating a radius of a curvature of a road ahead of a running motor vehicle, in which since two tangents

at two positions spaced at arbitrary distances from a point ahead of the motor vehicle are obtained by using contour points corresponding to the road and the radius of curvature of a lane on which the motor vehicle is running is approximately calculated from *an angle formed between the two tangents*, the radius of curvature of the lane on which the motor vehicle can be obtained accurately.” (emphasis added)

This aspect of Yasui’s disclosure is explained later in the “Detailed Description of the Invention.” The previously found contour points are used to calculate two tangents at two positions spaced arbitrary distances from a point ahead of the motor vehicle. [Yasui, Col. 9, lines 19-28]. Then, the angle formed between the two tangents is calculated to obtain a radius of curvature of a lane on which the motor vehicle is running. [Yasui, Col. 9, lines 28-41]. Thus, this portion of Yasui’s disclosure shows that the radius of curvature of a motor vehicle lane is approximated using an angle formed between the two tangents defined by lane markers.

Nothing in Yasui’s disclosure, however, suggests that the distribution of luminous pixels of the road edges can be used instead. Accordingly, Yasui fails to teach, disclose or suggest “analyzing this discrimination by comparing the distribution of luminosity and determining an angle of a bend of the road” as recited in Applicants’ claim 1.

None of the secondary and tertiary references (i.e., Kuwano, Stam, Liao) is alleged by the office action to alleviate the above-described deficiency(ies).

Accordingly, as Applicants cannot find the final analysis step of their claim 1 in the cited references, at least independent claim 1 is respectfully asserted to be in

condition for allowance. Dependent claims 2-30 are believed to be in condition for allowance for at least similar reasons.

Applicant has chosen in the interest of expediting prosecution of this patent application to distinguish the cited documents from the pending claims as set forth above. These statements should not be regarded in any way as admissions that the cited documents are, in fact, prior art. Likewise, Applicant has chosen not to swear behind the documents cited by the office action or to otherwise submit evidence to traverse the rejection at this time. Applicant, however, reserves the right, as provided by 37 C.F.R. §§ 1.131 and 1.132, to do so in the future as appropriate. Finally, Applicant has not specifically addressed the rejections of the dependent claims. Applicant respectfully submits that the independent claims, from which they depend, are in condition for allowance as set forth above. Accordingly, the dependent claims also are in condition for allowance. Applicant, however, reserves the right to address such rejections of the dependent claims in the future as appropriate.

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CONCLUSION

For the above-stated reasons, this application is respectfully asserted to be in condition for allowance. An early and favorable examination on the merits is requested. In the event that a telephone conference would facilitate the examination of this application in any way, the Examiner is invited to contact the undersigned at the number provided.

THE COMMISSIONER IS HEREBY AUTHORIZED TO CHARGE ANY ADDITIONAL FEES WHICH MAY BE REQUIRED FOR THE TIMELY CONSIDERATION OF THIS AMENDMENT UNDER 37 C.F.R. §§ 1.16 AND 1.17, OR CREDIT ANY OVERPAYMENT TO DEPOSIT ACCOUNT NO. 13-4500, ORDER NO. 1948-4830.

Respectfully submitted,
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